ET240104 724us

Application for United States Patent

of

Newton James Smith, Jr., *et al*

for

5   Accessibility on Demand

CROSS-REFERENCE TO RELATED APPLICATIONS

(CLAIMING BENEFIT UNDER 35 U.S.C. 120)

Not applicable.

10   ## FEDERALLY SPONSORED RESEARCH

AND DEVELOPMENT STATEMENT

This invention was not developed in conjunction with any Federally sponsored

contract.

MICROFICHE APPENDIX

15   Not applicable.

INCORPORATION BY REFERENCE

Not applicable.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to processor and computer-based

devices which allow a user to select special needs accessibility features, such as

5   display, audio, keyboard and pointing device settings and preferences on computers,

personal digital assistants, telephones, Internet appliances, and the like.

Description of the Related Art

Many modern devices used in daily life are processor-based. Some devices,

such as personal computers ("PC") and personal digital assistants ("PDA") are

10   equipped with processors capable of executing sophisticated programs such as word

processors, web browsers, voice recognizors, text-to-speech converters, and

handwriting recognizors, and are provided with full or partial keyboards,

touch-sensitive pointing devices and screens, color graphic displays, speakers,

microphones and cameras. Many other devices are provided with low-cost, highly

15   specialized processors, such as those found in microwave ovens, cable converter

boxes, televisions and audio entertainment systems, digital answering machines, and

wireless telephones. In the latter case, the displays, keyboards, pointing devices, and

audio peripherals may be cost-reduced devices such as LED or LCD displays,

multifunction keypads, and up/down/left/right keys. Most electronic devices in

20   widespread use today can be viewed in one of these two categories, to a greater or

lesser degree.

Turning to FIGURE 1, a generalized view of a microprocessor-based device (10) is shown. The heart of the device is a processor (11) which executes one or more software or firmware programs, and which typically has some form of persistent memory (15) such as FlashROM or hard disks. Many devices (10) are equipped with

5   a display driver (12) for driving a display (104), such as a PC VGA card for a computer monitor or an LCD driver integrated circuit for an LCD display. In some systems, audio output may be a function, and the device may be provided with an audio driver (13) and one or more speakers (102, 103), such as a PC sound card and speakers or a headset driver amplifier and headset. A microphone (16) and camera

10   (17) may be supplied in some configurations. More sophisticated or advanced devices, such as personal computers, are typically provided with a full keyboard and pointing device, while others may be provided with a specialized or custom keypad (14).

Many microprocessor-based devices (10) are also provided with

15   communications capability, such as a wireless transceiver (105), network interface to a computer network (19), or modem or telephony interface to a telephone network (100).

The fundamental components in this arrangement describe in general the architecture of devices ranging from cell phones, to appliances, to personal

20   computers. In each individual case, the type of processor employed and peripherals provided are varied to create a different device with greater or lesser sophistication, cost and capability.

Many microprocessor-based systems have adjustments which may be individually controlled and set by a user, depending on environmental conditions and the user's ability to interact with the device. For example, a cellular phone typically has adjustments for speaker volume, ring type and volume, and LCD display contrast

5 and brightness. It may also have a setting to enable and disable beep tones when to provide audible feedback when a key is successfully pressed. Personal computers are equipped with user preferences including display brightness and contrast, font and icon size, keyboard speed, pointing device speed and sensitivity, pointer tail length, and speaker volume.

10 For users who have physical impairments which prevent normal interaction with the device, such as sight or hearing loss, reduced tactile sensitivity, or lack of fine motor skills, these individual settings may be very useful for adapting the device to their personal use.

However, typically, these settings are global in nature, and they remain set

15 until the system is reconfigured otherwise. For example, a cell phone may provide a speaker volume setting which is effective for all calls made or received on the telephone. As such, the user may be required to adjust the volume when the environment changes, such as turning up the volume in the presence of background noise, and turning down the volume when in quieter environments, in order to enable

20 the telephone to work properly with the user's hearing aid. In another example situation, a partially sight-impaired user of a personal computer may have to adjust

the display contrast one way for use of a word processor program, and another way for use of a graphics-oriented program such as a photograph editor.

This global nature of these accessibility settings further presents a problem for individuals whose impairment is not constant all the time, and who interact with

5   several programs or applications for which enhanced or modified accessibility is not always needed. This forces the user to constantly reconfigure the system for different accessibility settings as various programs are used.

One of the more advanced examples of a microprocessor-based device is a personal computer, such as an IBM-compatible PC equipped with LINUX or

10   Microsoft's Windows [TM] operating system. These operating systems provide settings for special needs accessibility such as display font and icon size, mouse responsiveness and speed, keyboard "sticky keys" which allow normally simultaneous key combinations to be entered in sequence, etc. However, even these sophisticated systems do not provide different settings for different programs or environmental

15   conditions, but only provide a global set of preferences for an individual user which are applied to all application programs run by that user.

Further, there are many programs which the physically challenged may run in conjunction with each other, such as a voice recognizor program with a word processor program for a user with severe arthritis, or a text-to-speech converter

20   program with an e-mail reader for the visually impaired. However, in most systems, the user must "launch" these programs individually which may pose additional problems and inconveniences for a user with special needs.

Therefore, there is a need in the art for a system and method which provides "accessibility on demand" which assigns different accessibility settings and preferences with different programs, environmental conditions, and users. There is a need in the art for a system and method which allows a user to specify groups of

5   accessibility profiles for each program the user may run, to define companion programs to be automatically launched with accessibility profiles for the companion programs, and to set environmental conditions which enable or select these groups of settings.

10

BRIEF DESCRIPTION OF THE DRAWINGS

The following detailed description when taken in conjunction with the figures

presented herein provide a complete disclosure of the invention.

5   FIGURE 1 shows the generalized architecture of a processor-based device.

FIGURE 2 illustrates the high-level method used to create and edit

accessibility profiles.

FIGURE 3 sets forth the high-level method used to enable different

accessibility settings for different programs and to launch companion programs.

10   FIGURE 4 depicts the functional organization of the preferred embodiment of

the invention.

FIGURE 5 shows an example graphical user interface dialog for creating and

editing accessibility profiles.

SUMMARY OF THE INVENTION

User-defined accessibility profiles are created for different environments, such as time of day or application environment (e.g., word processing applications, but not web browsing), or such as raising the volume level on a phone conversation (through

5 a computer), but not while listening to a music CD. The profiles are organized and stored in processor-readable memory, and are retrieved upon activation of a program, operation of a system function, or automatic execution of a program. The processor parses the appropriate accessibility profile(s), adjusts the available system accessibility settings, and launches any associated companion program(s), which may

10 themselves have accessibility profiles. The user can also select and enable a certain accessibility profile as needed by simply selecting a menu option or a toggle switch. As such, each user can define accessibility profiles for each program which determine preferred speaker volume settings, display settings, keyboard and keypad characteristics, and automatically invoked companion programs such as voice

15 recognizors, text-to-speech converters, and gesture recognizors.

DETAILED DESCRIPTION OF THE INVENTION

The invention is preferably realized as an application program in a personal computer, such as Linux or a Microsoft Windows compatible program, on a system which provides an application programming interface ("API") group of functions for

5   control of accessibility settings such as speaker volume, display characteristics (font, resolution, contrast, colors, etc.), keyboard characteristics (repeat speed, sticky keys, key maps, etc.), and pointing device characteristics (sensitivity, speed, pointer tail, etc.).

Further, the invention is preferably realized on a microprocessor-based system

10   which provides some amount of persistent memory, such as a hard drive in a personal computer or battery-backed RAM in a handheld telephone.

It will be recognized by those skilled in the art that the invention as described herein may alternatively be implemented as fully custom firmware or software in processor-based systems which are not equipped with full operating systems, as well

15   as software in less sophisticated devices, such as appliances and handheld or portable electronics. For example, it may be used to set system display, keyboard, and audio characteristics in a wireless telephone, or personal digital assistant.

Throughout this document, several terminology conventions are used in order to enable the disclosure to be viewed relative to more sophisticated

20   microprocessor-based systems, such as personal computers, as well as to more function-specific microprocessor-based devices, such as wireless telephones, personal digital assistants ("PDA") and Internet appliances. The term "application program"

generally refers to a program that is added to a device or system, such as a word

processor on a personal computer or a downloadable plug-in for a web-enabled

wireless telephone. The term "system function" generally refers to a function inherent

to the system, such as a programmable function key ("F-key") on a personal computer

5   or an autodial button on a wireless telephone. An accessibility profile can be

"assigned" to a system function or to an application program, such that user selection

or operation of that system function or application program causes the profile to be

enabled. Further, additional "companion" system functions and/or application

programs may be "associated" with a particular profile, such that when the system

10   function or application program to which the particular profile is assigned is executed,

the "associated" system functions and application programs are automatically

operated. This may be useful to, for example, launch a voice recognition companion

application program each time a word processor application program is operated.

In the preferred embodiment, the general hardware architecture of FIGURE 1

15   is adapted with the addition of an accessibility profile repository in persistent memory

(15), such as on a PC hard drive in a file or database. The accessibility profile

repository contains one or more accessibility profiles, each of which defines system

accessibility settings assigned to specific application programs, system functions,

and/or user ID's. These may be as simple as line entries in flat text files, may be

20   records in a database, or entries in a system repository, which associate program

attributes to accessibility profiles. TABLE 1 shows an example set of accessibility

profiles for two hypothetical users, embodied in a text file in comma-separated

variable ("CSV") format.

TABLE 1: Example Accessibility Profiles

5
---

user="bob", appl=MSWord, font=18pts, contrast=high,

    companion1="IBMViaVoice", profile_name="Bob's Word"<CR>

user="bob", appl=AutoDialer, called_number="555-1212", vol=max <CR>

user="jill", appl=LotusMail, vol=max, companion1="CentigramTTS" <CR>

10   user="jill", appl=CDPlayer, vol=medium <CR>

user=*, font=medium, vol=medium, profile_name="All Standard",

    tone=medium, contrast=medium <CR>

<EOF>

15

In this example, a user "bob" has two accessibility profiles defined for two

application programs, Microsoft Word and an AutoDialer program. For Microsoft

Word, Bob has set the font to an easy to read large setting of 18 points, the display

contrast to high, and enabled the automatic launching of the IBM ViaVoice voice

20   recognition program to allow him to edit documents by voice. And, he has named

this profile "Bob's Word". For his AutoDialer program, he has set the speaker volume to maximum only when the dialed number is 555-1212, but not otherwise.

The second user, "jill", also has two defined profiles, the first of which is for an e-mail program LotusMail. When she invokes LotusMail, the system speaker

5   volume is set to maximum, and a companion text-to-speech conversion program is launched to enable her computer to audibly "read" her e-mail to her. Her second profile sets the system speaker volume to a medium level when running a CD player program.

Another profile, not associated with a specific user or application program,

10   and which sets speaker volume to a medium level, fonts to a medium size, contrast to a medium setting, and tone to a medium level. This profile has been named "All Standard".

These profiles alternatively can be stored in a binary format for embedded processing applications, as will be recognized by those skilled in the art. And, they

15   can contain considerably more parameters than given in the example, to select specific fonts, colors, volume settings, etc. In another example shown in TABLE 2, a cellular telephone could set the microphone amplification based upon a number dialed, or the speaker volume based upon a caller ID value on a received call. This allows the user to create a customized list which automatically adjusts the system

20   performance when the user calls a hearing impaired friend, or when the user receives a call from a friend who has respiratory difficulties and cannot speak loudly.

TABLE 2: Example Telephone Accessibility Profiles

CalledNumber="976-1234", mic_amp=max <EOR>

5   CallerID="albert", spkr_vol=max <EOR>

The general method for establishing and managing accessibility profiles is as follows:

10   1.   Certain accessibility features of the system can be grouped into a single setting, called an accessibility profile. The accessibility profiles can preferably be named.

        2.   As part of the accessibility profile, the user can select one or more applications so that the accessibility features are

15   automatically enabled whenever these applications are loaded.

        3.   When the application is loaded or executed, the accessibility profile becomes active, and when the application ends the accessibility profile is disabled.

        4.   The user also has the option of selecting and enabling an accessibility

20   profile using a simple menu option, a hot-key, a toggle switch, or other user control.

5.   When multiple accessibility profiles are enabled, the current

application determines the current accessibility profile. For

example, if loading the web browser enables special mouse

operations, loading a game may load a different accessibility

5   profile.

6.   Accessibility profiles can be grouped into other profiles. For

example, several font and backlight profiles can be created, and

one of these can be enabled for mobile operation in low light,

and other for desktop operation with office lighting.

10   7.   Accessibility profiles can be transferred to another machine as

a set, such that a guest user can enable the guest's customized

accessibility features without having to reconfigure the

foreign machine.

8.   The accessibility profile also contains user-specific information, such

15   as the user's name or ID, so that when the user logs onto a system

such as Windows 2000, the accessibility profile(s) are available, and

can be automatically enabled.

Turning to FIGURE 2, the fundamental logical process of establishing new

and editing existing accessibility profiles is given. First, the user invokes (20) a

20   system function or program called the "Accessibility Profile Manager" to create or

update accessibility profiles. In the preferred embodiment in a personal computer,

this invocation may be made by selecting a tab or icon within the system

configuration folder, such as the Accessibility Options icon in the Microsoft

Windows[TM] Control Panel, or by selecting a desktop icon. Or, the Accessibility

Profile Manager may be invoked by editing the "properties" of a program on a

5　personal computer, such as "right clicking" on a desktop icon for a particular program

and selecting the "properties" option in a Windows[TM]-based computer.

On other microprocessor-based systems such as a PDA or wireless telephone,

the Accessibility Profile Manager may be accessed through a specific key or menu

option.

10　The system then preferably provides a Graphical User Interface ("GUI") dialog

or group of dialogs, which allows the user to select (21) to edit an existing profile or

create a new one. If the user selects to edit an existing profile, a list of existing

profiles is provided. For example, the user may have previously defined the profiles

as shown in TABLE 1, so the user may choose from the list of existing profiles as

15　shown in TABLE 3, sorted by profile name, by the application program or system

function to which a profile is assigned, or by User ID.

TABLE 3: Example Listing Accessibility Profiles

20　　　　　　　　　　　　Choose a profile by:

Application or

Profile Name	System Function	User ID
Bob's Word	MSWord	bob
--	AutoDialer	bob
--	LotusMail	jill
--	CDPlayer	jill
All Standard	MSWord	--

When the user selects an existing profile to edit, it is "opened" (22) for editing, such as opening the text file example given in TABLE 1. If the user selects to create (21) a new profile, a profile template is "opened" (23).

Next, a GUI is preferably provided to allow the user to select or change system accessibility settings for the selected profile, such as speaker volume level, microphone sensitivity, display contrast and font size, etc. Then, the user is optionally allowed to select (25) "companion" programs to automatically run when the application program is executed or system function is operated.

The user is prompted to assign (26) or re-assign the profile to an application program or system function. For example, in a computer system, the user may assign the profile to a word processor such that when the word processor is run, all of the system accessibility settings are automatically adjusted to those defined in the profile, and any companion programs are automatically launched. In a simpler device, such as a wireless telephone, this profile may be assigned to a system function, such as a

speed dial key, which automatically causes the system accessibility settings to be

adjusted when the speed dial key is operated. In this latter example, one might want

to increase the microphone sensitivity on a wireless telephone when a particular speed

dial key is operated because the user is aware that the usual recipient of the call is

5   hearing impaired. Preferably, the user is also allowed to assign the profile to a user

ID if the system has the capability of receiving user ID's from the user.

The user is also allowed to name (27) the profile, which allows it to be

selected and enabled from a list of named profiles, such as the example given in

TABLE 3.

10   An example of such a GUI dialog for creating and editing profiles is shown in

FIGURE 5. The create/edit accessibility profile dialog (50) preferably provides a

profile naming input (51), including a drop-down list button to display all previously

named profiles. If a previously named profile is selected, all of the existing

definitions for that profile are shown in the dialog for editing.

15   Further, an "assigned to" input (52) is provided to allow the profile to be

assigned to a particular system function, such as an autodial key or F-key, or an

application program, such as a word processor or spreadsheet program. A drop-down

list button is preferably provided to allow the user to quickly select pre-defined

system functions and/or application programs, as well as a "browse" button to allow

20   the user to search for an application program within the system.

Also, the profile may optionally be associated with a specific user identifier by completing the "user/owner" input (53), which is also preferably provided with a drop-down list of predefined user names or ID's.

The create/edit accessibility profile dialog (50) also provides an group of

5   accessibility settings (54) for each system feature that can be controlled via the profile, such as a group of check boxes or radio buttons, slider controls, or drop-down lists (55). If a setting is not specified to be changed, it will not be affected by the enabling of the profile. So, for this example of FIGURE 5, if a user leaves the "speaker volume" checkbox unchecked, the speaker volume will not be changed when

10   this profile is enabled. However, if the user does want the font to be set to a large size by this profile, the font slider may be moved to increase the font size setting. As shown in FIGURE 5, the preferred embodiment of the accessibility profile dialog (50) includes an option to preview the setting being selected, such as playing an audio sound from the speaker when setting the speaker volume, or viewing an sample letter

15   in its rendered size and contrast when adjusting the font size and contrast.

Also according to the preferred embodiment, a list (56) of companion programs or system functions is provided, which allows the user to add, delete, and browse for entries. These companion programs may themselves have accessibility profiles, as well.

20   Further according to the preferred embodiment, the records of the accessibility profile database (or data structures or text files) may be copied to portable media, such as a floppy diskette or CompactFlash card, or attached to an e-mail, for transport

to another system or device to enable a user to use the accessibility profiles on that

system or device.

During operation of the system or device, the logical flow set forth in FIGURE

3 is followed to automatically use the accessibility profiles and launch companion

5   programs. Whenever a program is executed (30), a system function is operated, or a

named profile is enabled, the system examines (31) the accessibility profiles for an

existing profile assigned to the selected application program, system function, or

profile name. If no profile exists, the selected program is launched normally (34).

However, if a profile is found, the system accessibility settings and options are set

10   (32) appropriately according to the accessibility profile, and any companion programs

may be launched (33). Then, the selected program or system function is launched

(34).

Preferably, a "policy" is provided by the operating system or Accessibility

Profile Manager, which establishes the rules and logic which determine how profiles

15   may override each other as they are enabled. For example, a simple policy would be

that the last or most recent profile enabled supersedes or overrides all previous

settings until the assigned program is terminated. So, if the profile named "All

Standard" as given in TABLE 1 is first selected or enabled, and then later Bob logs

into the system and runs MSWord, his profile named "Bob's Word" would be enabled.

20   This would cause the font to be changed from medium to large, and the contrast to be

set to high, and IBMViaVoice to be launched automatically. When the user

terminates an instance of MSWord, the operating system or Accessibility Profile

Manager would return the system settings to those defined by the "All Standard"

profile, namely medium font size and standard display contrast.

Alternatively, the user may view a list of available named profiles through any

of the common user interface methods such as selecting a menu function or an icon,

5   or may use a system button such as a toggle switch. The user may then select a

profile to "activate", which causes the system accessibility settings to be adjusted

according to the profile without having to run a specific application program or select

a specific system function. For example, the user may have a profile named

"Restaurant Mode" in a wireless telephone which may increase the speaker volume

10   and decrease microphone sensitivity. This profile, though, is not assigned to an

system function or application program, and can simply be selected from a menu of

profiles or using a toggle switch when the user enters an environment with high

ambient noise, such as a restaurant.

Turning to FIGURE 4, the functional organization of the preferred

15   embodiment is disclosed. The invention is realized as an program, the Accessibility

Profile Manager (43), running under a personal computer operating system such as

Linux or Microsoft Windows[TM]. These operating systems provide application

program interface ("API") functions (41) which allow programs such as the

Accessibility Profile Manager (43) and application programs (42) to set system

20   input/output parameters such as brightness for the display driver, volume for the

sound card, keyboard speed and mouse responsiveness, etc. These types of operating

systems also typically allow one application program to invoke other programs, and as

such, the Accessibility Profile Manager (43) may invoke a user-selected program and

other companion programs (42).

The system also includes a file, database or repository of accessibility profiles,

preferably stored in system persistent memory such as FlashROM, battery-backed

5   RAM, or a hard disk drive. The profiles are readable and modifiable by the

Accessibility Profile Manager (43).

It will be recognized by those skilled in the art that a wide variety of

implementation variations from the disclosed preferred embodiment may be adopted

without departing from the spirit and scope of the invention, such as the use of a

10   BlueTooth transceiver as the wireless interface, the targeting of the software for an

embedded processor in an appliance or handheld device, or inclusion of gesture

recognition software for processing images of sign language captured from a system

camera. It will also be recognized that the profile enabling function can be performed

responsive to system automatic execution of application programs, such as by the

15   scheduling of a program to run by a CRON daemon in a UNIX-based computer.

Certainly, alternate processor-based platforms, operating systems, and programming

methodologies can likewise be adopted. It is intended that this description is for

purposes of illustration only and should not be construed in a limiting sense. The

scope of this invention should be limited only by the language of the following

20   claims.